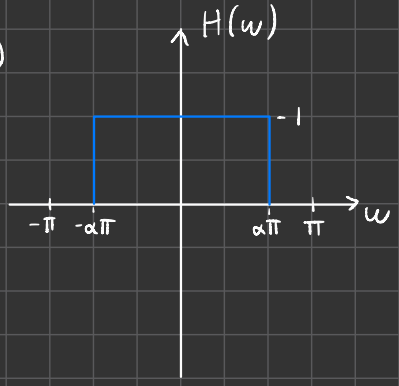
Jack Girard
ECE 637
Exam #2

2

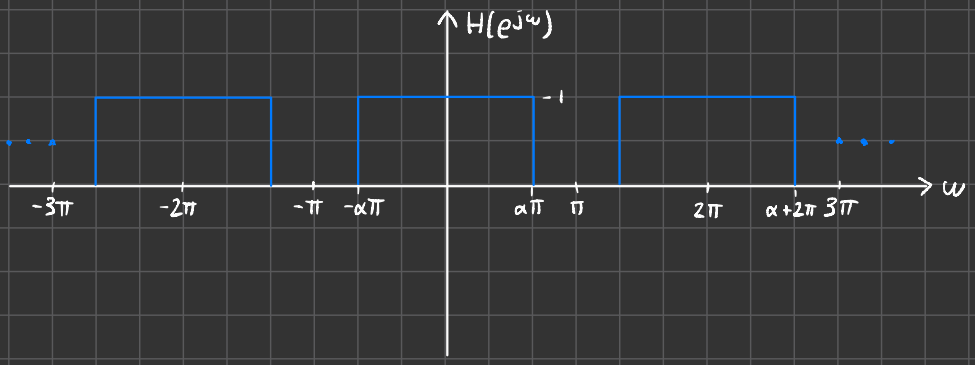
2.1)



2.2) For $|w| < \pi$: $H(w) = \text{rect}\left(\frac{1/\alpha \cdot w}{2\pi}\right) \rightarrow D = \frac{1}{\alpha}$

For all w: $$H(w) = \sum_{k=-\infty}^{\infty} \text{rect}\left(\frac{1}{\alpha} \cdot \frac{w - 2\pi k}{2\pi}\right) = \text{prect}_{2\pi\alpha}(w)$$

2.3)

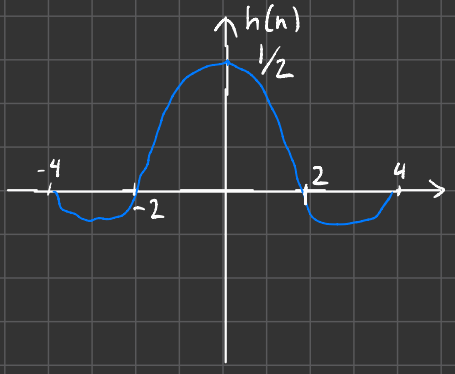


2.4) $H(w)$ is 2π-periodic, so any value outside of $w = [-\pi, \pi]$ can be determined with simple addition/multiplication

2.5) $$H(e^{jw}) = \sum_{k=-\infty}^{\infty} \text{rect}\left(\frac{1}{\alpha} \cdot \frac{w - 2\pi k}{2\pi}\right) \quad ; T = 1$$

↳ using sampling formula: $h(n) = \frac{1}{D}\,\text{sinc}\left(\frac{n}{D}\right) = \alpha\,\text{sinc}(\alpha n)$

2.6)



2.7) when $\alpha = 1$: $h(n) = \text{sinc}(n)$

↳ This impulse response corresponds to zero decimation